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(58) Field of search
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(71) Applicant
GQ Defence Equipment Limited (United Kingdom),
Catteshall Lane, Godalming, Surrey GU7 1LH

(72) Inventors
Roger Frederick Allen,
Colin Ian Campbell

(74) Agent and/or Address for Service
Brewer & Son,
5-9 Quality Court, Chancery Lane, London WC2A 1HT

(54) **Load deployment device**

(57) A load deployment device for deploying an aerial load (11) comprises a carriage (17) constrained to move along a track (18) and load engagement arms (25,26) carried by the carriage (17) and movable at a deployment location on the track (18) in a direction transverse to the direction of movement of the carriage (17) from engaged positions in which they engage and support the load to retracted positions in which they are clear of the load (11). The load is an aircraft test model. The arms (25,26) are held into engagement with the model by guide rails (38,39). At the launch point, the guide rails terminate, the carriage (17) is brought rapidly to a stop, and the arms (25,26) pivot away from the model to release the latter.

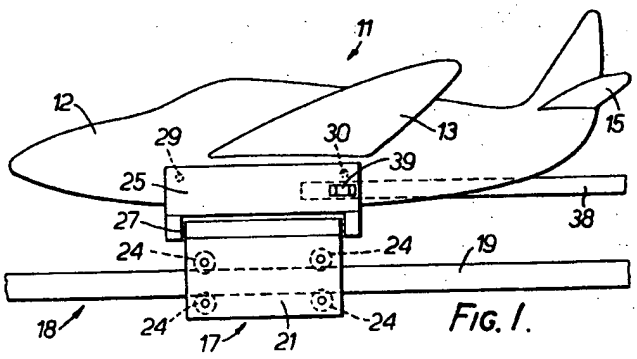

FIG. 1.

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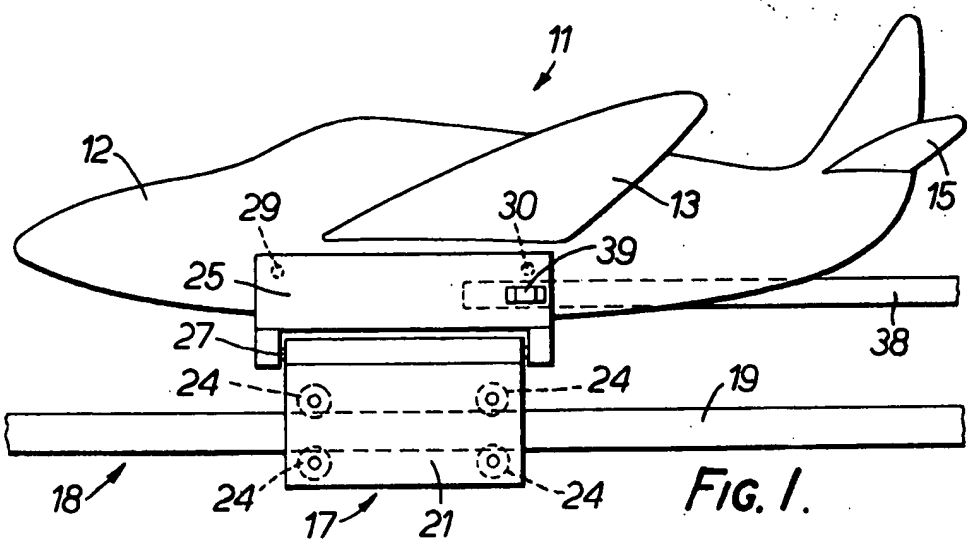

FIG. 1.

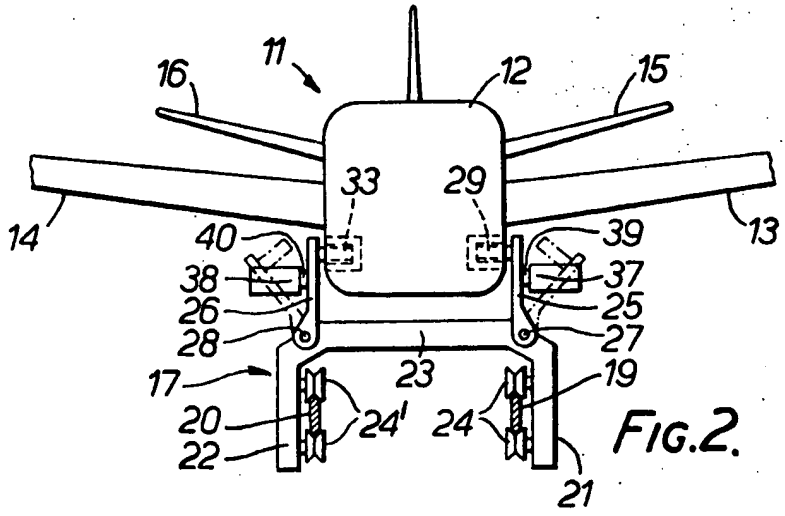

FIG. 2.

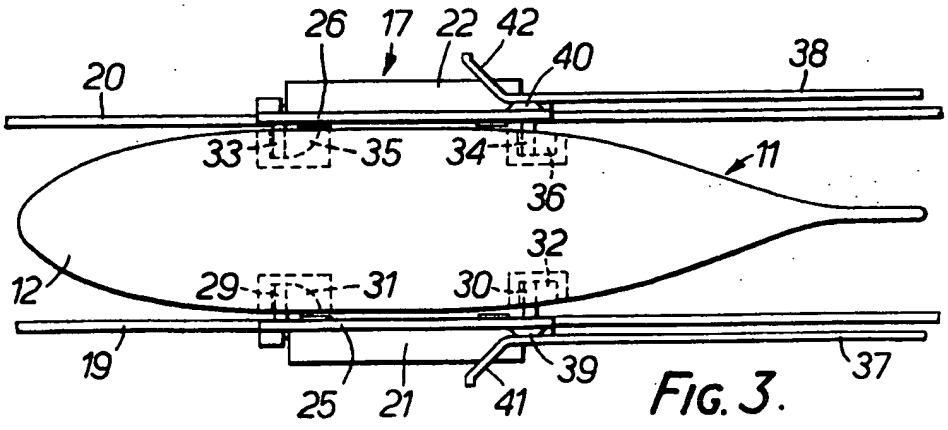

FIG. 3.

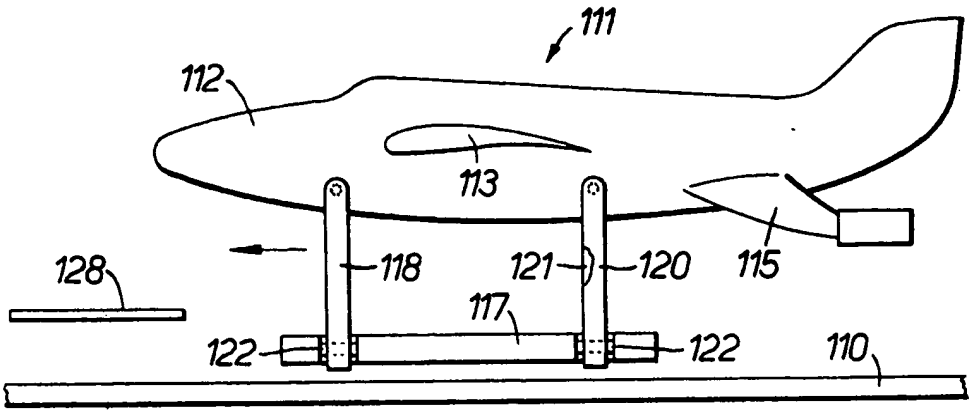
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FIG. 4.

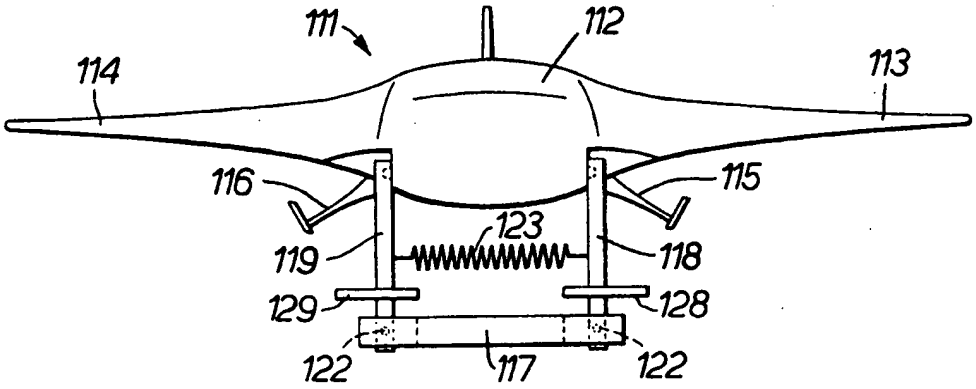
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FIG. 5.

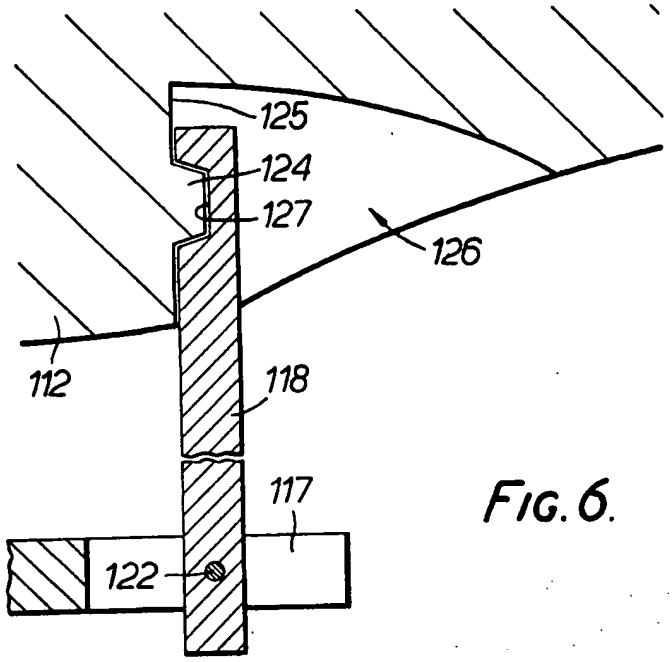

FIG. 6.

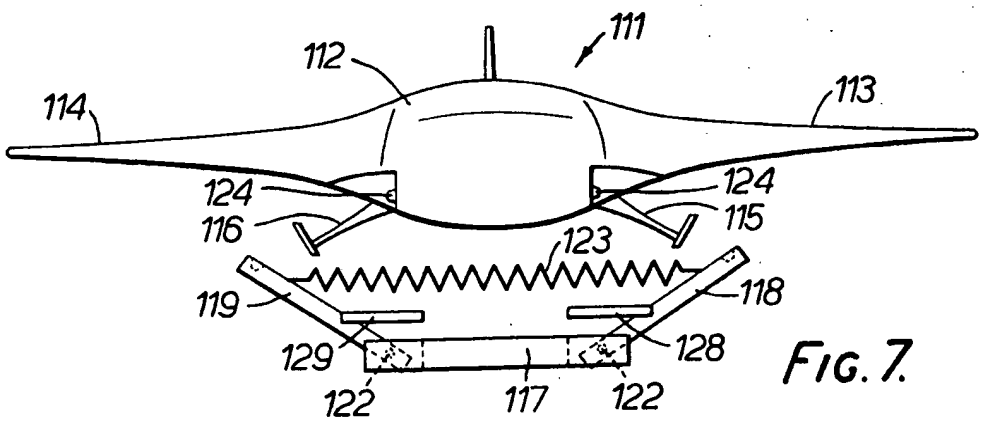

FIG. 7.

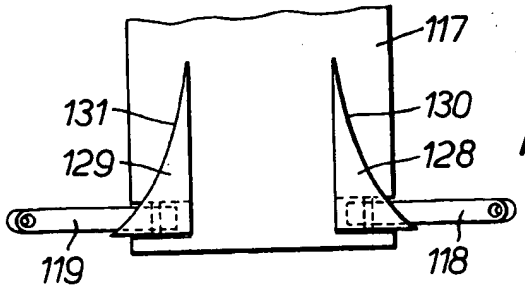

FIG. 8.

SPECIFICATION

Load deployment device.

The present invention relates to a load deployment device and is particularly although not exclusively concerned with a device for launching aircraft test models from a ground station.

An aircraft test model launching device has been proposed in which the model is supported by support arms upstanding from a carriage which is driven along a track from a start position at one end of the track to a deployment position at the other end of the track. At the deployment position the carriage is brought to rest and the aircraft model released from the support arms and propelled forwardly into the air under its own momentum. In the proposed arrangement, the upstanding support arms are pivotally mounted at their lowermost ends on the carriage for pivotal movement about axes at right-angles to the direction of travel of the carriage and are arranged to pivot forwardly on the carriage under their own momentum when the carriage is brought to rest. The arms are arranged to engage laterally extending bosses protruding from the model and are so constructed that they close round the boss during traverse of the carriage along the track and move to an open configuration at the end of the track to enable the model to free itself from the support arms.

It will be appreciated that in the hitherto proposed launching device the upper ends of the support arms at the instant when the model is released from them are travelling at the same speed as the model and although the upper ends are rapidly moved through an arc and finally brought to rest with the carriage there is the disadvantage that the time it takes for the upper ends of the arms to move clear of the released model can be such as to cause fouling of the arms with trailing control surfaces protruding from the model. In addition, there is the disadvantage that the construction of the arms to provide for the model to be held securely during movement of the carriage along the track whilst providing for release of the model at the end of the track is complex.

It is an object of the present invention to provide an aircraft test model launching device which does not suffer from the above-mentioned disadvantages.

According to the present invention there is provided a load deployment device for deploying an aerial load comprising load support means for supporting the load and for deploying the load by causing relative displacement between the support means and the load in a predetermined direction whilst releasing the load from the support means, the support means being movable at deployment of the load from an engaged position in which it engages and supports the load to a retracted position in which it is clear of the load, characterised in that the support means is at deployment of the load movable from the engaged position to the retracted position in a direction transverse to the predetermined direction.

In preferred embodiments of the invention the device includes a track along which the load support means is guided and drive means for driving the load support means from a start location at one end of the track to a deployment location at the other end of the track, at which the load is deployed. The load support means then preferably comprises a carriage constrained to move along the track and load engagement means carried by the carriage and movable at the deployment location on the track in a direction transverse to the direction of movement of the carriage from an engaged position in which it engages and supports the load to a retracted position in which it is clear of the load.

In one embodiment of the invention the device comprises holding means for holding the load engagement means in its engaged position during movement of the carriage from the start location to the deployment location and for releasing the load engagement means at the deployment location and displacement means are provided so to engage the load engagement means as to move it from the engaged position to the retracted position at the deployment location on the track. The displacement means may then be an inclined surface formed on the aerial load for engagement by the load engagement means and means provided for arresting the carriage at the deployment location on the track so that the load engagement means is moved from its engaged position to its retracted position by riding up the inclined surface when the aerial load advances relative to the arrested carriage at the deployment location.

The load engagement means may be freely movable on the carriage from the engaged position to the retracted position, whereby it moves to its retracted position clear of the load solely by the thrust imparted to it by the inclined surface of the load. The holding means may then comprise a guide rail extending along the track from the start location to the deployment location.

The load engagement means may comprise a support plate on each side of the carriage for engagement with each side of the load and a support member carried by the plate for engagement in a recess formed in the load. The inclined surface may then be provided by the rear wall of the recess at each side of the load. The support member may be in the form of a front pin on the plate engaging with a front recess in the side of the load and each plate may be provided with a back pin spaced from the front pin and engageable in a rear recess in the side of the load. Furthermore, the rear pin of each plate preferably so engages the cooperating rear recess in the load as to provide only for vertical location of the load on the carriage.

In an alternative embodiment of the invention, the load engagement means is biased into the engaged position and the device further comprises displacement means at the deployment location on the track so to engage the load engagement means as to move it from the engaged position to the retracted position against the bias applied to it. The displacement means then preferably comprises one or more deflector members carrying profiles so disposed in and inclined to the path traversed by the load engagement means during movement of the car-

model 11 is then accelerated along the track 18 under the action of a compressed air launcher so that it arrives at the deployment location as shown in Figures 1 to 3 at a velocity sufficient to produce an effective launch of the model 11. During acceleration of the carriage 17 along the track 18 the front pins 29 and 33 apply a forward thrust to the model 11 by engagement with the flat vertical front walls of the recesses 31 and 35. The pins 30 and 34 may if desired serve also to provide forward thrust to the model 11 by engagement with the vertical front walls of the recesses 32 and 36, although in the preferred embodiment as illustrated the pins 30 and 34 serve solely to provide for vertical location of the model 11 on the carriage.

Upon arrival of the carriage 17 at the deployment location the support plates 25 and 26 pass beyond the end of the guide rails 37 and 38 are then no longer constrained to maintain the vertical disposition shown in Figures 1 to 3. At this time, the carriage is then abruptly brought to rest, whereupon the model 11 moves forward under its own momentum relative to the carriage 17 arrested on the track 18. As a consequence of this relative movement, the pins 20 and 33 on the support plates 25 and 26 are caused to ride up the curved rear walls of the recesses 31 and 35 and to pivot the support plates 25 and 26 outwardly with a sufficient thrust to cause them to move to retracted positions as shown in chain-dot lines in Figure 2 in which they are clear of the model 11 which is then freed for launching into the air under its own momentum. Where appropriate a power unit in the model provides for sustained flight. Launching of the model 11 in this way is achieved smoothly and without the hazard that the support plates 25 and 26 may not move sufficiently fast to clear protruding surfaces on the model 11.

It will be seen that the front recesses 31 and 35 of the model 11 are formed with rear walls which are concave. It will however be appreciated that a simple flat inclined rear wall may alternatively be used, provided that the transverse thrust imparted to each support plate by engagement of the front pin with the wall is sufficient to move the support plate well clear of the fuselage 12 of the model 11 and any surfaces protruding from it.

Referring now to Figures 4 and 5 of the drawings, an aircraft test model 111 having a fuselage 112, port and starboard wings 113 and 114 and tailplane assemblies 115 and 116 is supported on a carriage 117 by upstanding laterally spaced forward support arms 118 and 119 and rearward laterally spaced upstanding support arms 120 and 121. The carriage 117 is mounted by means not shown on a track 110 for horizontal movement in the direction indicated by the arrow.

Each of the arms 118 to 121 is supported at its lower end on a pivot pin 122 extending in the direction of travel of the carriage 117 and is held in the upstanding engaged position shown in Figures 1 and 2 by a tension spring 123 extending between the arms 118 and 119 and a further tension spring not shown extending between the arms 120 and 121.

Referring now to Figure 6, the arm 118 is shown in its engaged position in which a boss 124 protruding laterally from a wall 125 of a recess 126 in the fuselage 112 engaged in a frusto-conical recess 127 in the end of the arm 118. The other arms 119 to 121 are arranged in like manner to engage protruding bosses formed in recesses in the fuselage 112.

The support arms 118 to 121 are held in the engaged positions by the tension springs during traverse of the carriage 122 from a start location at one end of the track to a depolyment location at the other end of the track. At the deployment location of the track there are arranged, as best illustrated in Figure 8, two stationary deflector plates 128 and 129 formed with edge profiles 130 and 131. As will be seen from the drawings, the two deflector plates 128 and 129 are arranged in a horizontal plane above the level of the pivot pins 122 and are so disposed that their profiles 130 and 131 lie in the paths of the upstanding arms 118 and 120 and 119 and 121 when the carriage moves into the deployment location on the track 110. Upon engagement with the profiles 130 and 131, the arms 18 to 121 are deflected thereby and pivot outwardly on their pivot pins 122, finally reaching retracted positions as illustrated in Figures 7 and 8. In moving from the engaged position illustrated in Figure 6 to the retracted position as illustrated in Figures 7 and 8, the arm 118 moves against the action of its biasing spring 123 in an arc about its pivot pin 122, the upper end of the arm moving out of the recess 126 and clear of the fuselage 112. As the arm 118 and the fuselage 112 are at the instant of deployment travelling at the same speed disengagement of the arm from the frusto-conical boss 124 is not obstructed in any way. Means not shown are provided for holding the arm 118 in the retracted position following its traverse past the plate 128. The other arms 119, 120 and 121 function in the same manner as the arm 118 and the same considerations apply to them.

As best seen in Figure 8, the arms 118 and 119 in taking up their retracted positions move clear of the model 111 and in particular clear of the depending tailplane assemblies 115 and 116. Similarly the arms 120 and 121 in moving to their retracted positions move clear of the tailplane assemblies 115 and 116.

It is considered desirable although not essential to provide profiles 130 and 131 which are curved so that the support arms 118 to 121 move to their retracted positions at a gradually increasing angular velocities.

In operation, air launching of the model 111 is carried out by first setting the carriage 117 at its start position on the track 110, and mounting the model 111 on the carriage by bringing the support arms into engagement with the support bosses. The carriage 117 is then accelerated along the track 110 preferably under the action of a compressed air launcher so that it arrives at the deployment location at a velocity sufficient to produce an effective launch of the model. At the deployment location the carriage 117 passes beneath the deflector plates 128 and 129, which cause the support arms 118 to 121 to retract from the fuselage 112, thereby freeing the model 111 for launching into the air under its own momentum. The carriage 117 is then brought to rest at a position on the track beyond the deflector plates

engaged position to the retracted position under the action of the deflector member or members.

18. A device according to claim 17, wherein each support arm is biased into the engaged position by biasing means and is movable from the engaged position to the retracted position aginst the biasing action of the biasing means.

19. A device according to claim 18, wherein the load is supported by two forward and two rearward support arms upstanding from the carriage and engaging opposite sides of the load and wherein the deflector member or members are provided with edge profiles for engagment by the arms.

20. A device according to claim 19, wherein the profiles lie in a plane parallel to the direction of travel of the carriage on the track and are inclined to the direction of travel of the carriage.

21. A device according to claim 20, wherein each of the profiles follows a straight line.

22. A device according to claim 20, wherein each of the profiles follows a curve which is such as to provide for gradually increasing rates of deflection of the arm from the engaged positions to the retracted positions.

23. A device according to any of claims 19 to 22, wherein each support arm is provided with a recess or opening at the end thereof which engages the load, wherein the load carries a support boss which engages in the recess when the arm is moved to the engaged position and wherein the load is supported by the arm by engagement of the boss in the recess or opening.

24. A device according to claim 23, wherein the boss is formed in a recessed portion of the load so as not to project from the load and wherein the arm in moving from the retracted position to the engaged position passes into the recessed portion of the load for engagement with the boss.

25. A device according to claim 24, wherein the boss is of frusto-conical form and the recess or opening in the arm conforms to it.

26. A device according to any of claims 2 to 25, wherein the drive means for driving the carriage comprises a drive element engageable with the carriage and arranged to be driven along the track by fluid under pressure.

27. A launching device for launching an aircraft test model, substantially as hereinbefore described with reference to Figures 1 to 3 or 4 to 8 of the accompanying drawings.

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N° 854.371

Société Schneider et Cie
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Pl. unique

Fig. 1.

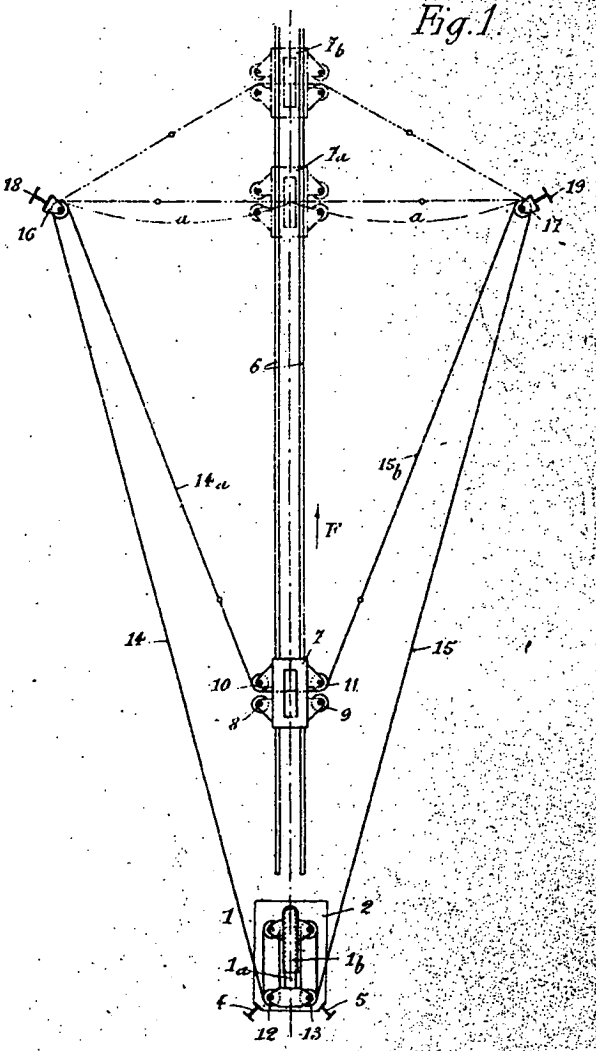


Fig. 2.

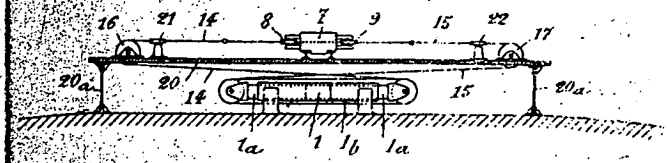
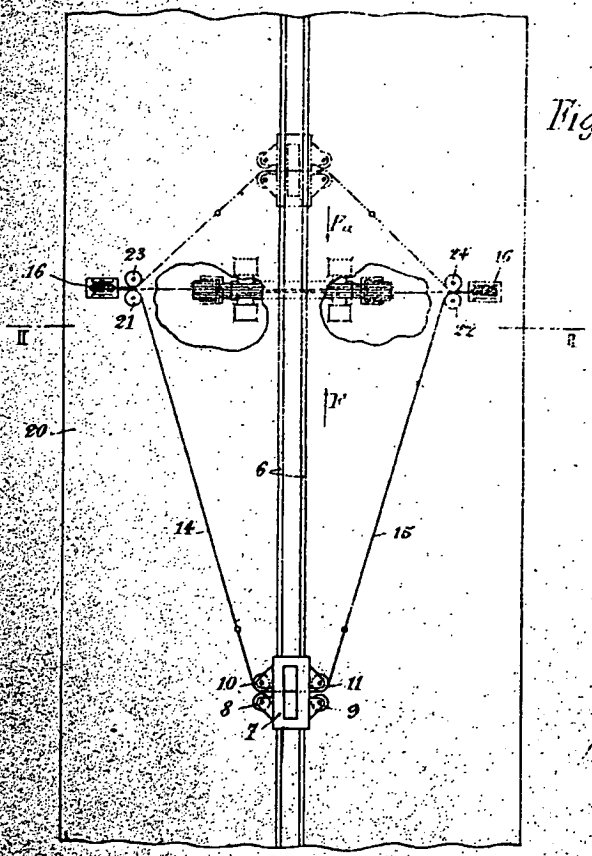


Fig. 3.



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DIRECTION DE LA PROPRIÉTÉ INDUSTRIELLE.

BREVET D'INVENTION.

Gr. 6. — Cl. 4. N° 854.371

Perfectionnements aux dispositifs de catapultage.

Société SCHNEIDER & C^ie^ et M. Jean FIEUX résidant en France (Seine).

Demandé le 30 décembre 1938, à 14^h^ 3^m^, à Paris.
Délivré le 15 janvier 1940. — Publié le 11 avril 1940.

[Brevet d'invention dont la délivrance a été ajournée en exécution de l'article 11, § 7, de la loi du 5 juillet 1844 modifiée par la loi du 7 avril 1902.]

On sait que le lancement par catapulte de planeurs ou d'avions pose, à l'heure actuelle, des questions délicates à résoudre, tant en raison des vitesses de départ élevées qu'il est nécessaire de communiquer à des masses de plus en plus importantes, qu'en raison de la nécessité d'avoir recours, dans certains cas, à des moyens compatibles avec des installations de fortune, pour éteindre le mouvement des masses à retenir après la course de propulsion (chariot de lancement, câble, piston, etc.).

Des efforts considérables ont déjà été entrepris, à la fois, pour améliorer les conditions dans lesquelles évoluent les forces appliquées aux éléments à lancer, et pour atténuer les réactions de toutes sortes imposées aux organes de propulsion, ainsi qu'au matériel d'infrastructure. Mais ces efforts ne semblent pas avoir encore abouti à une solution simple, qui soit vraiment satisfaisante.

Les dispositifs de catapultage actuellement connus sont du type que l'on peut appeler « à traction simple ». Ils ne présentent pas toute la souplesse désirable pour adapter l'effort dont on dispose aux conditions effectives de lancement et de freinage que l'on veut réaliser. Ils nécessitent notamment l'emploi de freins auxiliaires, pour l'absorption progressive de l'énergie cinétique du chariot et des organes de propulsion. La puissance et l'encombrement de ces freins exigent une infrastructure incompatible avec l'aménagement d'installations de fortune, qui doivent être réalisées en peu de temps sur un terrain quelconque.

En outre, de tels dispositifs ne se prêtent au renversement du sens de lancement sur la même voie, dans des conditions acceptables, que si l'on a prévu deux infrastructures de freinage indépendantes l'une de l'autre, chacune d'elles ne pouvant être utilisée que pour un seul sens de marche.

Pratiquement, d'autre part, ils ne permettent pas de retenir, le cas échéant, si on le désire, l'ensemble de la masse propulsée (chariot et sa charge), ni par conséquent, de procéder à des essais de fonctionnement dans des conditions réellement voisines des conditions effectives d'un lancement réel, en utilisant un lest approprié destiné à rester solidaire du chariot.

La présente invention a pour objet un dispositif de catapultage « à traction indirecte ou composée », ce dispositif étant caractérisé par le fait que du système de mouflage utilisé pour multiplier, de toute façon convenable, la vitesse de déplacement de l'élément propulseur proprement dit,

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brins internes 14^a, 15^b qui tend constamment à se raccourcir, tire sur le chariot 7 et le fait avancer dans le sens de la flèche F, suivant un mouvement dont la vitesse et l'accélération sont à la fois fonctions du mécanisme 1 et de la distance a qui sépare les points fixes 18 et 19 de l'axe de la voie 6.

Cette action se poursuit jusqu'au moment où le chariot 7, arrivant dans la position 7^a dans laquelle il est représenté en traits mixtes sur le dessin, les deux brins 14^a, 15^b se trouvent dans le prolongement l'un de l'autre, position qui correspond dans le cas considéré à la fin de la course du piston moteur 1^a de l'organisme propulseur.

A partir de ce moment, c'est le chariot qui, tendant par inertie et sous l'effet de la force vive qu'il a emmagasinée à continuer à se déplacer pour se rendre de la position 7^a à la position 7^b (également représenté en traits mixtes sur le dessin), entraîne à son tour le câble en l'obligeant à se développer de nouveau malgré l'effort antagoniste qui lui est opposé par le mécanisme de propulsion, par exemple, par les gaz qui sont encore enfermés dans le cylindre 1^b du propulseur.

La résistance dudit mécanisme de propulsion et l'inertie du câble lui-même assurent, de façon avantageuse, le freinage progressif et l'arrêt final du chariot de lancement.

Il est facile de comprendre que la fatigue imposée au câble par son arrêt au moment du passage du chariot à la position 7^a et son départ en sens inverse est d'autant plus faible que la longueur a qui sépare les points fixes 18 et 19 de l'axe de la voie 6 est plus grande.

Le choix judicieux de cette distance permet d'éviter toute rupture de câble.

Dans le mode de réalisation représenté sur les figures 2 et 3, mode de réalisation dans lequel le dispositif est, par exemple, installé en partie sur une plateforme 20, et en partie sous cette plateforme, par exemple la plateforme d'un navire, le dispositif comporte, convenablement ancré sous la plateforme et relié à elle par des supports 20^a, un mécanisme propulseur 1 à double effet équilibré, par exemple du genre de celui décrit dans le brevet français déposé le 13 septembre 1938 par les demandeurs, pour « Catapulte compensée » comportant un cylindre de travail unique 1_i et deux pistons opposés 1_a — 1_a, desquels partent les câbles 14 et 15 qui, après avoir traversé la plateforme à travers des ouvertures convenables et être passés sur les poulies fixes à axe horizontal 16, 17, passent, avant de se rendre entre les poulies 8, 9, 10 et 11 du chariot 7, sur des poulies de renvoi à axe vertical fixe 21, 22 ou 23, 24 suivant le sens dans lequel le câble se développe.

Il est parfaitement évident que par raison de symétrie, un tel dispositif peut fonctionner aussi bien dans le sens de la flèche F que dans le sens de la flèche F^a.

RÉSUMÉ.

L'invention vise :

1° Un dispositif de catapultage à action indirecte pour le lancement d'avions, planeurs ou autres objets analogues, caractérisé par le fait que, du système de mouflage utilisé pour multiplier la vitesse de déplacement de l'élément mobile du mécanisme propulseur proprement dit, partent deux brins courants qui, convenablement réunis entre eux après qu'ils sont passés sur deux organes de renvoi disposés de part et d'autre de la voie de lancement, viennent attaquer le chariot de lancement porté par ladite voie, de la même manière que la corde d'une arbalète attaque la flèche ou le projectile qu'elle est destinée à projeter dans l'espace ;

2° Un mode de réalisation du dispositif précité dans lequel le mécanisme propulseur est disposé sous la voie de lancement entre les points latéraux de renvoi, de manière à réaliser une installation symétrique qui permet d'utiliser la voie de lancement dans n'importe quel sens ;

3° Un mode de réalisation suivant 1° et 2°, dans lequel le mécanisme de propulsion est un mécanisme à double effet équilibré.

Société SCHNEIDER & C^ie^
et M. Jean FIEUX.

Par procuration :
BERT et DE KERAVENANT.

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